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GENERALIZATION CHARACTERISTICS OF FORM DIVERSITY
AND NOVEL FORM PRODUCTION AMONG PRESCHOOL CHILDREN

by

Craig B. Boswell

A dissertation submitted in partial fulfillment
of the requirement for the degree

of

DOCTOR OF PHILOSOPHY

in

Psychology

Approved:

UTAH STATE UNIVERSITY
Logan, Utah

1978

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A handwritten signature in cursive script, reading "Craig B. Boswell". The signature is written in dark ink and is positioned on the right side of the page, below the main body of text.

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ABSTRACT

Generalization Characteristics of Form Diversity
and Novel Form Production Among Preschool Children

by

Craig B. Boswell, Doctor of Philosophy

Utah State University, 1978

Major Professor: Dr. Glendon Casto

Department: Psychology

The blockbuilding, Lego construction, pen drawing, and painting of four preschool children were analyzed in terms of the construction of form diversity and new form production. Social descriptive reinforcement, contingent on the production of any form not previously constructed within the current session and overt modeling of forms never seen produced during the study, increased form diversity scores per session and new form production (forms never seen before in the child's total prior sequence of blockbuilding sessions).

The results indicated that after training, form diversity scores generalized to topographically similar and dissimilar media of expression. New form production generalized to topographically similar and dissimilar media in the majority of the children.

(69 pages)

CHAPTER I

STATEMENT OF THE PROBLEM

Research focusing on the manifestations of creative behaviors has typically addressed the issues of education and training. The proliferation and loose application of terms such as divergent thinking, originality, novelty, productive thinking, brainstorming, creativity, along with a poor understanding of basic processes involved in nurturing creative process, has encouraged numerous educational programs for the identification and/or enhancement of creative behaviors. Many educators have not been aware that to comprehend the pedagogic implications of research on creative behaviors, they need to examine behavioral principles that explain the production of creative behavior. Furthermore, experimental analysis of creativity requires operational definitions for the components of creative behaviors. For example, one component of creative behavior as mentioned in Kneller (1965) includes the essential elements of novelty. Novel behavior is produced when an individual emits a behavior that expresses an idea, artifact, or form of behavior that is new to him.

The problem is that research on identification and/or enhancement of creative behavior has contributed relatively little to the understanding of ways in which creative behaviors are acquired or generalized from one medium of expression to another (Holman, Goetz, & Baer, 1977).

Therefore, it seems important to investigate the influence of training on one medium of creative expression and the generalization of diverse form and novel form production to another medium of creative expression. Also, the possibility that novel form production may transfer by virtue of contingent reinforcement and/or observational learning needs further exploration. In essence, this study attempted to provide information concerning the training of one type of creativity in children and the possible transfer of training from one creative medium of expression to another.

Three major questions directed this research. In a sample of four female preschool children, the implementation of both descriptive social reinforcement and modeling of diverse form construction raised these following questions: (1) Can training produce form diversity and new form production within a medium? (2) Can form diversity and new form production generalize to a new but topographically similar medium of expression? (3) Can form diversity and new form production generalize to a new but topographically dissimilar medium of expression?

CHAPTER II

REVIEW OF LITERATURE

This review of literature will begin with a review of the definition of creativity and proceed with a historical perspective. It will then focus on a review of experimental research that may be relevant to the problem of devising techniques for increasing novel behaviors and suggest behavioral principles that may explain the production of novel responses. Finally, research specific to the question of form diversity and new form production will be reviewed and pertinent studies providing possible methodology will be cited.

Many researchers will agree that a major obstacle in the analysis of creativity is the lack of objective definitions of creative behavioral components. Guilford (1968) in presenting his theoretical model for the "complete structure of the intellect" was one of the first to initiate studies of creativity. He defined a creative individual according to traits. The creative were said to have traits such as inventing, designing, contriving, comparing, and planning. Earlier, Ghiselin (1955) defined creativity as "the process of development of evolution in the organization of subjective life." Finally, Fliegler (1959) stated that creativity was man's ability to "manipulate external symbols or objects to produce an unusual event uncommon to himself and/or his environment."

Goetz and Baer (1971, 1972) indicated that the major problem confronting researchers in the area of "creativity" is the lack of lucid, reliable, operational definitions for the creative behaviors. Some of the response properties purported by Guilford (1967) to be necessary for creativity to occur are (a) fluency, referring to the number of "ideas" produced on a creative task; (b) flexibility, describing the number of qualitatively different categories needed to group the responses; and (c) originality, referring to cleverness, remoteness, or the statistical infrequency of a particular response to a specific task.

The problem of defining "creativity" occurs because what is regarded as creative at any one point in time is a function of many factors operating in the society. Creativity typically refers to products of behavior and the reactions of other members of a society to that product. Moreover, creativity is the product of behavior relative to the given individual's past behavior. The element of novelty specific to the individual has been incorporated into much of the recent research on diversity (creativity). Kneller (1965) has pointed out that for the most part, it has been the element of novelty that has traditionally guided the study of creativity since the products are more easily assessed than an individual's traits as described by Guilford (1967). Kneller concluded that a definition of creativity must include the element of novelty--behavior that is new to the subject.

One operational definition of an aspect of creative behavior is the occurrence of a different or novel response to the same stimulus class as compared to the same response to the same stimulus class. The definition equates creativity to novel or original behavior, i. e., behaviors that an individual has not displayed previously in a particular setting; or behavior that has not been displayed by individuals of the same age, group, class, or culture. This author agrees with Kneller that creative behavior must include the element of novelty or new form production. For the purpose of this review, there will be no distinction between novelty and originality. The implications are that an individual may be highly novel and concurrently original.

Historical Perspective

The enhancement of creativity has been attempted in a variety of ways. For example, one way has been the writing of fiction with accompanying plot and characters, based upon an unusual column in a newspaper. The assumption was that this form of exercise would increase originality or novelty of an individual's writing skills (Slosson & Downey, 1922). Another attempt was a procedure of group ideation (brainstorming) which is a free association procedure absent of criticism in order to avoid inhibition of unusual ideas (Osborn, 1957).

Experimental research on the problem of creativity has been completed in three general areas in recent years: (1) In the investigation of the "nature of creativity," some researchers have compared

groups of "creative" versus "non-creative" individuals; e.g., comparison of recognized creative groups such as architects, writers, or scientists have been compared with groups not known for creative output such as factory workers, policemen, or truck drivers. (2) Other researchers have been concerned with conditions affecting creativity. That is, what conditions facilitate or inhibit creative behavior, i.e., company policies, kinds of supervision, psychological climate, etc. (3) Finally, there have been experiments that addressed the effects of different types of training upon the production of creativity; i.e., creative training may be in the form of special exercises designed to facilitate creative production (Maltzman, et al., 1958). This review will focus upon the last general area of experimental research.

One operational definition of an aspect of creative behavior is the occurrence of a new or different behavior to the same stimulus class. For example, Maltzman, Bogartz, and Breger (1958) studied a modified free association procedure in which stimulus words were selected on the basis of restricted response hierarchies. A control group received a list of 25 words to which they gave free associations and a different final list of 25 words to which they gave free associations. The control group then received the Unusual Uses Test of originality developed by Guilford in 1950. One experimental group received the same treatment except that the initial list was presented five additional times with instructions to give a different response on each repetition. A second experimental group was given the same treatment as the

former group except the experimenter said "good" after every five unusual responses. The subjects were divided into two groups. The first half of the subjects in each group was instructed to be as original as possible. The other half was told nothing. The results showed that on the free association test, the subgroup that received training in addition to instructions was significantly more original than the control group receiving instructions alone. The researchers concluded that additional information was needed to determine characteristics that influenced originality production.

In another study in this series, Maltzman (1960) used a training procedure which consistently facilitated originality of word association in college students. His training procedure involved the repeated presentations of a list of stimulus words in an associational exercise accompanied by instructions to give a different response to each stimulus word presented. When students were presented with a new stimulus word, the individuals who had received training were reliably more original than those individuals who had not received training. The basic assumption of Maltzman (1960) was that if originality can be learned according to principles of operant conditioning, then originality production would be controlled by general principles of learning.

Using a precise behavioral specification of components of creativity, Goetz and Baer (1971, 1973) demonstrated the possibility of increasing the form diversity of a blockbuilding task in three

female preschool children by reinforcing individual production of new block forms for each child. More specifically, they gave descriptive social reinforcement contingent on the production of any form not previously constructed within the current session. Subsequently, Goetz and Baer increased the number of different forms built per session. New forms emerged at a higher ratio during the reinforcement period than during the baseline period or reinforcement for the same form period. In the reinforcement for the same form period of study, the individuals were reinforced for placing and/or rearranging blocks of a form already apparent in that session's construction.

Goetz and Salmonson (1972) continued Goetz and Baer's (1971) line of investigation into novel production by using easel painting as a new medium. They also observed specific types of teacher attention that might be related to an increase in "creative behavior. Their research suggests that a teacher can, through the type of attention he gives, increase creative behaviors in children. The use of descriptive praise, comments directed towards a specific form and description of it, was the most effective for the three children under study. This type of praise necessitates that the teacher study different forms that children make so that he can identify them and respond specifically to them. Goetz and Salmonson's result questions whether just giving children "practice" in easel painting without feedback will help develop creative behaviors.

More recently Fallon and Goetz (1975) investigated creativity by using the medium of felt pen drawing. They used a multiple baseline design across three subjects; each subject was successively reinforced for making diverse or novel forms of drawing using a felt pen. Form diversity scores were calculated according to the number of different forms appearing for the first time in a single drawing. New form production scores were calculated according to the number of new forms observed for the first time throughout the entire study. Results indicated an increased form diversity score when descriptive social reinforcement was applied contingent upon the production of any form not previously constructed within the current drawings. Six to ten weeks after intervention, each subject was observed and the data showed that the two subjects that received the greater number of contingent reinforcements maintained their high level of form diversity. The third subject who received fewer reinforced behaviors declined slightly from his mean.

The results of these studies together suggest that an individual who wishes to develop creative behaviors in a young child can do so by contingent reinforcement. Support for the above conclusion has been demonstrated by Glover and Gary (1976). They modified Torrance's (1966) description of four components of creativity [(a) fluency, (b) flexibility, (c) elaboration, and (d) originality]. They defined these components of creative behavior operationally in lists of all possible uses of objects by fourth and fifth-grade students and related these

operationally defined variables to scores on the Torrance Thinking Creatively with Words Test. By utilizing instruction, reinforcement (team points), and practice, the four major components of creativity described by Torrance were successfully modified with a corresponding increase in the students' scores on the Torrance Thinking Creatively with Words Test.

The above conclusions are consistent with findings of Zimmerman and Dialessi (1973) who suggested that a human model can influence an observer's subsequent verbal creative response. They addressed a second issue involving the nature of the social set created by the model--the function of a generalized eliciting stimulus. Separate groups of fifth grade children observed a model who was either high or low in the fluency of flexibility creativity dimension as defined by Guilford (1967). High model fluency was found to increase significantly the children's fluency and flexibility measures on a task. Also, not only did the model's performance affect the children's responses on a similar verbal task, but the children's responses generalized to different types of verbal creative tasks. The novel verbal responses observed by Zimmerman, et al. were within the same medium, i. e., verbal description. The generalizations across verbal tasks within the same medium were also observed in previous studies (Zimmerman & Pike, 1972; Zimmerman & Rosenthal, 1972). Recently, Arem and Zimmerman (1976) compared the relative effectiveness of demonstration and verbal instruction in teaching creative behaviors to retarded and nonretarded

children. The overt modeling of a creative strategy was most effective in improving elaboration, although verbal description also aided performance. The results indicated that the retarded children were less able to demonstrate novel behaviors than the nonretarded.

The studies described above suggest that observational learning cannot be dismissed as simply reflecting the exact reproduction of the model's response. Instead, it appears that the observers acquire a strategy from the model's performance and not mimicry or exact copying of a model's behavior.

Generalization

The need for generalization methodology--the transfer of a response in a stimulus class--has been frequently stressed in the literature (Baer, et al., 1968; Stokes & Baer, 1977). The emphasis, refinement, and elaboration of a methodology which will specify more precisely conditions that favor the occurrence of generalization are major areas for study using the methods of applied behavior analysis. There has been a gradual emergence of studies that have addressed the primary questions of generalization methodology, i. e., research related to generalization programming development, maintenance, and generalization of social greeting responses (Kale, Kaye, Whelan, & Hopkins, 1968); active generalization of effects through a planned program for curtailment of self-injurious behaviors (Corte, Wolfe, & Locke, 1971); and generalization of trained conversational speech form in nonverbal individuals (Garcia, 1974).

Recently, Stokes and Baer (1977) reviewed and summarized the structure of generalization literature and its implicit embryonic technology categorizing studies designed to assess or program generalization according to nine general headings: Training and Hope; Sequential Modification; Introduction to Natural Maintaining Contingencies; Train Sufficient Exemplars; Train Loosely; Use Indiscriminate Contingencies; Program Common Stimuli; Mediate Generalization; and Train "to Generalize." The last category Train "to Generalize" considers generalization as a response itself, and reinforcement contingencies may be placed on it, the same as with any other operant. Few studies of this type are found in the literature of applied behavior analysis. Perhaps behaviorists consider generalization as an outcome of behavioral change rather than as a behavior itself.

The area of "creative behavior," defined objectively in terms of the invention of new behaviors should become the area of choice when research is directed toward generalization problems because the essence of creativity, as defined, is the constant generalization from already established behaviors. Thus studies of creativity may make a large contribution to the development of a generalization methodology.

Holman, Goetz, and Baer (1977) conducted a series of studies addressing the issues of generalization across creative mediums. They repeated the basic procedures useful in generating diverse form construction found in Goetz and Baer (1973). However, they concurrently examined the form diversity generalization in other media of

children's form production. Their first experiment used descriptive social reinforcement contingent on the production of form diversity in the medium of easel painting. Descriptive social reinforcement was defined as a combination of praise and a simple verbal description of the form contingent on the first appearance of each different form painted. At the same time, blockbuilding performance by the children was examined for correlated changes. The results indicated that the use of descriptive praise resulted in an increase in form diversity production for both easel painting and blockbuilding. However, no systematic changes in the child's rate of inventing new forms in blockbuilding were observed. Thus, generalization to concurrent blockbuilding occurred only in form diversity of blockbuilding and the emergence of new blockbuilding forms was not observed.

The researchers sought to explain the lack of a stronger generalization effect by utilizing closely related behaviors such as media which required similar skills. Experiment 2 used four concurrent media; felt pen drawing, easel painting, blockbuilding, and Lego construction. Training of form diversity was conducted with felt pen and concurrent generalization was examined in the other three media. The results indicated that generalization of novel responding was extended more easily and more reliably to the similar than to the dissimilar tasks. However, the authors concluded that

generalization across tasks while observable, was quite variable, somewhat inconsistent, and usually of limited magnitude in these studies. To the extent that generalization

across tasks is valued as evidence of a truly valuable behavior change reasonably interpreted as a concept of creativity usable by the child, the problem of securing such generalization must still be considered unsolved (Holman, Goetz, & Baer, 1977).

The problem that exists is that research has not demonstrated generalization from one medium of creative expression to another. The possibility that novel form production may transfer by virtue of contingent reinforcement and/or observational learning needs further exploration. The current research will be carried out to demonstrate the presence and procedures of novel production generalization.

Three major questions directed this research. In a sample of four female preschool children, the implementation of both descriptive social reinforcement and modeling of diverse form construction raised these following questions: (1) Can training produce form diversity and new form production within a medium? (2) Can form diversity and new form production generalize to a new but topographically similar medium of expression? (3) Can form diversity and new form production generalize to a new but topographically dissimilar medium of expression?

CHAPTER III

METHODS

Subjects

The subjects were selected from the total population of female children (approximately 25) at Developmental Day School, a local day care center for children between the ages of three to six. Four children were used for this study ($N = 4$). Female children were used simply to avoid a sex difference variable. Subject One was four years, four months old; Subject Two was five years old; Subject Three was four years, five months old; and Subject Four was five years, one month old.

A letter describing the purpose and procedures of the study and a request for permission for the children's participation was sent to parents or guardians, signed by parents or guardians, and is on file at Developmental Day School. Children's involvement was in accordance with the ethical guidelines established for Utah State University. A copy of the consent form can be found in Appendix A. Staff members at Developmental Day School were asked to note informally children who were notably deficient in well-developed pen drawing, painting, blockbuilding, and Lego construction skills. One week before data collection, an activity was organized for the children where pen drawing, painting, blockbuilding, and Lego construction was introduced. The

four subjects who scored the lowest were the individuals asked to participate in the study.

Setting and Materials

The study took place in the Developmental Day School's library area located within the classroom. The area is enclosed from the floor to the ceiling and is approximately five by five meters. It is a clear expanse of carpeted floor area. One table (50 centimeters by 180 centimeters), one shelf displaying training blocks and Legos, one table with paper and pens, and one easel board with paint and brushes were used. The training sessions were conducted during the afternoon when the library area was free of all other children. Each subject was invited individually by the trainer (female) into the library area where she asked two of the subjects to work on three tasks in the following order--blockbuilding, Lego construction, and pen drawings. The other two subjects were asked to work on the following tasks--pen drawing, painting, and blockbuilding.

The experimental materials were either placed on the floor (blocks, Legos), table (paper and pens), or easel board (paint and brushes). The book shelf contained the same collection of 53 blocks for each child. There were 33 Legos, each the same width (1 1/2 centimeters) but of seven different lengths (from 0.8 centimeters to 2.5 centimeters), and colored red, blue, and white. The children were not required to use all of the blocks or Legos. Three felt-tip

pens were provided for drawing. Each pen was 13 centimeters long. One green, one blue, and one red felt pen were used. Placed directly in front of the subject was a piece of white paper, 28 by 38 centimeters. On the easel board there were three different paint cups (red, blue, and yellow) with a 1/2 inch brush in each. The size of the painting paper was 38 by 56 centimeters.

Behavior Definitions

Novel construction was defined as changes in form content of the subject's blockbuilding, Lego construction, painting, and drawing activities. Changes were seen in either form diversity (the number of different forms appearing at least once within the current session), or new form production (the number of forms appearing for the first time considering all previous sessions). Although scored from the same activities, form diversity and new form production are independent, e.g., a high diversity score does not necessarily mean a high new form score. Conversely, a new form score does not necessarily mean a low form diversity score. These definitions were developed in prior research that has established a usable set of form definitions, i.e., Goetz and Baer's (1973) blockbuilding, Fallon's (1975) felt-pen code, Beehler's (Holman, et al., 1977) Lego building code, and Goetz and Salmonson's (1972) easel painting code (examples of codes in Appendix B.)

Recording and Reliability

The observer (male) sitting a distance away from the trainer (female) recorded form diversity scores plus new forms scored. In

addition, the observer recorded whether or not production of any form was socially reinforced by the trainer or if modeling occurred prior to subject construction. The observer recorded verbal descriptions described by the trainer. The observer's records were generally used as a check on the trainer's efficiency in carrying out the contingencies required by the experimental design, rather than as a direct measure of the child's behavior in producing forms. However, the finished paintings were sometimes ambiguous in that forms painted early in the sessions were subsequently painted over by the child. In order to avoid a picture that could not be scored due to repeated painting, both trainer and observer recorded the children's form diversity production.

A series of photographs (Polaroid Land camera) were taken of each session's block and Lego construction from angles that allowed complete display of the structure. The photographs were taken after the child left the setting; the camera was not evident during the blockbuilding or Lego construction. Paintings and drawings were retained for later analysis.

Two judges, who were unaware of the conditions, underwent a systematic training session. Utilizing photographs, drawings, and paintings, the two judges were required to obtain a reliability score of 90 percent before proceeding to the scoring task. Afterwards, the judges independently examined the photographs, drawings, and paintings counting the number of forms appearing at least once in a series representing the session's construction. Reliability scores for each

dependent variable were calculated by dividing the total score during a session by one judge's recorded response into the total of the other judge's recorded responses, dividing the smaller by the larger and then converting the figure to a percentage. All percentages of agreement on the name, number, and sequencing of all forms exceeded 92 percent.

Procedures

Design. A multiple baseline with replication across subjects was used (Hersen & Barlow, 1976). The multiple baseline design requires continuous recording of the dependent variables of several subjects during baseline and experimental conditions. The independent variable is then introduced to each subject at different points in time during baseline. If changes in the dependent variables are due to the presentation of the independent variable, they occur sequentially upon the presentation of the independent variable to each subject. A multiple baseline is particularly useful when reversal or withdrawal of treatment conditions is undesirable. Other advantages of this design are (a) all subjects are exposed to all treatment conditions, (b) a small subject sample can be used, (c) it standardizes the effect of extraneous experimental variables such as time, place, effects (baseline manipulations, attention, etc.), and (d) it increases the opportunity for generalization of the findings to a clinical setting.

Data were taken on the form diversity score and cumulative new forms construction. The specific descriptive verbal reinforcement

for each new form and description of the experimenter's modeling was also recorded. Data were graphed in a multiple baseline fashion. It should be apparent that if modeling and descriptive social reinforcement are effective in controlling the development of novel form diversity and/or new form construction, each child's data should show an appreciable increase from baseline levels.

Baselines. The trainer and the observer sat quietly displaying neither approval or disapproval of any form that the subject made. The child had the opportunity to construct any form she wanted until (a) all of the materials were used; (b) when five minutes per task (total 15 minutes) had elapsed; or (c) until the child indicated she was finished. She usually indicated with a verbal statement of completion, by leaving her work, or by agreeing to the trainer's query, "Are you through?" At this time, the trainer either asked the child to work on another task or thanked her and gave her candy or a graham cracker (her choice). Before the session began and after every media change, the trainer mentioned to the child: "See these blocks (materials). I would like to see you build (draw) anything you want. I'll tell you when you can stop."

The length of the baseline for the subjects consisted of a combination of time and a stability criterion. Each subject met the stability criterion. The minimal number of baseline sessions for each subject was as follows:

<u>Subject</u>	<u>Minimal Baseline Sessions</u>
1	5
2	7
3	5
4	7

The stability criterion used prior to implementing each phase of the experiment was the mean form diversity score. Before implementation of the training phase, the form diversity score could not vary more than one standard deviation above or below the mean of the last three sessions.

Training. The procedure followed for the baseline was repeated for the training phase. However, during the training phase, the four children received from the trainer descriptive social reinforcement--a combination of praise and a simple verbal description of the form contingent on the first appearance of each different form constructed or each different form painted. The verbal descriptive reinforcement for all the constructions followed essentially the same pattern. The verbal content of the trainer's praise was descriptive of the task. "Good! You made an arch (circle, story, etc.). That's new and different. I like the way you put that block on the other block." The trainer would respond each time the child produced a form which had not appeared previously in the ongoing sessions. That is, the trainer rewarded the first production of any form within each session, but not subsequent productions of that form within the session. This required considerable flexibility on the part of the trainer who had to remember

which forms had already been produced that day. (At the time, it was possible to study the score sheets between form productions.)

In addition, the children received overt modeling from the trainer of four novel forms and a description of the responses per session. The forms that were modeled for the children were decided somewhat arbitrarily by the trainer on the basis of their current form diversity score.

The remarks of the trainer during demonstration (modeling phase) always emphasized the newness of the produced form. For example, the trainer said:

I'm going to make a fence (roof, arch, cross, etc.). See how the blocks are sitting next to each other. Now, I'm going to make an arch (roof, cross, floor, etc.). It looks like a window (cross, S. telephone pole, etc.). Now, (child's name), you make an arch. Then make something new or different.

The subject was asked to produce a form immediately after the physical structure construction or drawing by the trainer was disassembled or covered up. After the child reproduced and disassembled the modeled forms, the trainer said to the child, "You now can build (draw) anything you want. You have five minutes." Data were collected when the child began to build (draw).

The second phase of training was conducted on closely related behaviors using a medium which required skills more similar to those trained in Phase 1. For example, blockbuilding and Lego construction were topographically similar behaviors which required more similar

skills than those of blockbuilding and pen drawing. One child was trained on blockbuilding and Lego topographically similar media utilizing a modeling and description method of training. The other child was trained in a similar manner in the topographically similar media of pen drawing and painting (Table 1). Two children who were lowest in form diversity scores were chosen in order to document their rate of progress after Phase 2 was started. Furthermore, Phase 2 was instigated to increase the likelihood of generalization to a topographically dissimilar medium. Contingencies in training Phase 1 continued throughout the next training phase.

Table 1

Training Models

<u>Form Construction</u>	<u>Modeling & Descriptive Social Reinforcement</u>
Blockbuilding	
<u>Lego construction</u>	Subjects 1 and 4
Pen drawing (probe)	
Drawing/Painting	
Pen drawing	
<u>Painting</u>	Subjects 3 and 2
Blockbuilding (probe)	

Probes. Probes were administered to determine the extent to which training one medium generalized to another medium. For each training model, there was one probe medium. The probe in the form construction training model was pen drawing while the probe in the

drawing/painting model was blockbuilding. Probes were administered in a manner identical to the baseline phase without the trainer indicating approval or disapproval of form construction. The only involvement of the trainer was to mention to the child, "See these blocks (pens). I would like to see you build (draw) anything you want. I'll tell you when you can stop."

Probe trials began directly after the baseline phase of blockbuilding and Lego construction in the form construction training model, and pen drawing and painting in the drawing/painting training model (Table 2). Increases in novel pen drawing or blockbuilding monitored through the probing exercise for both form construction groups represent novel form diversity or new form generalized phenomena.

Table 2
Trial Sequencing

			Baseline	Block-building Training	Lego Construct. Training
Subject S ₁ S ₂	Form Construction Training Model	Blockbuilding (bb) Lego Const. (lc) Pen drawing (pd)	baseline baseline baseline	training baseline probes	baseline training probes
			Baseline	Pen Drawing Training	Painting Training
Subject S ₃ S ₄	Drawing Painting Training Model	Pen drawing (pd) Painting (p) Blockbuilding (bb)	baseline baseline baseline	training baseline probes	baseline training probes

Postcheck. A postcheck was administered to each of the subjects participating in the study. The sessions were conducted in the same manner as the baseline phase. The postcheck was administered three weeks after the completion of the study.

Data analysis. A single subject data analysis was used to graph form production, and form generalization data was visually inspected for concomitancy of variables. More specifically, the form diversity scores of four children were graphed on four behaviors (blockbuilding, Lego construction, drawing, and painting). The form diversity score and the cumulative new forms (forms never previously recorded) produced by the four children for the four behaviors (blockbuilding, Lego construction, drawing, and painting) were graphed. New form production scores represent cumulative increments over the score-produced baseline session (Tables 3 and 4). The scores were means of the baseline sessions and were compared with the mean of the training sessions. The probe score was represented in the same manner.

CHAPTER IV

RESULTS

Three major questions directed this research. Results relating to each question are presented as follows:

Question 1: Can training produce form diversity and new form production within a medium?

Question 2: Can form diversity and new form production generalize to a new but topographically similar medium of expression?

Question 3: Can form diversity and new form production generalize to a new but topographically dissimilar medium of expression?

Form Diversity

Figure 1 shows each child's form diversity score (the number of forms appearing at least once in a single drawing). The training package, descriptive social reinforcement, overt modeling of a novel form, and a description of the response were administered to each child on either the fifth or seventh session. All children showed a stable baseline in form diversity score, but the score increased when the training package was introduced.

In the blockbuilding medium, Subject One (Figure 1) had a mean score of 2.0 forms per drawing during baseline, and she subsequently

increased to 7.0 during Phase 1 (reinforcement and modeling). Subject Four (Figure 1) had a mean score of 3.1 forms per drawing during baseline and increased to 8.3 during Phase 1. The two other children had pen drawing as the target of training. Subject Two's (Figure 1) average score increased from 2.0 to 9.0; while Subject Three's (Figure 1) average score increased from 3.2 to 8.0. During the observations of blockbuilding with Subjects One and Four (Figure 1), and pen drawing with Subjects Two and Three (Figure 1), other media of creative expression were scored (Lego construction, painting). Their average scores are shown in Table 3.

Phase 2, reinforcement and modeling, was applied to Subjects One and Three in the media of Lego construction and painting respectively. They both showed an appreciable increase in scores. Subject One had a mean score of 3.1 during baseline and increased to 7.0 forms per drawing during Phase 2. Subject Three had an average of 4.5 during baseline which increase to 9.0 forms produced during Phase 2. In conclusion, form diversity scores increased at the onset of reinforcement and modeling in their respective media. (See Figure 1).

Cumulative New Form

Each child's new form score (the number of forms appearing in a given session's construction that had not appeared in any prior construction) is shown in Figure 2. The increase in a session over the immediately preceding session is the number of new forms that

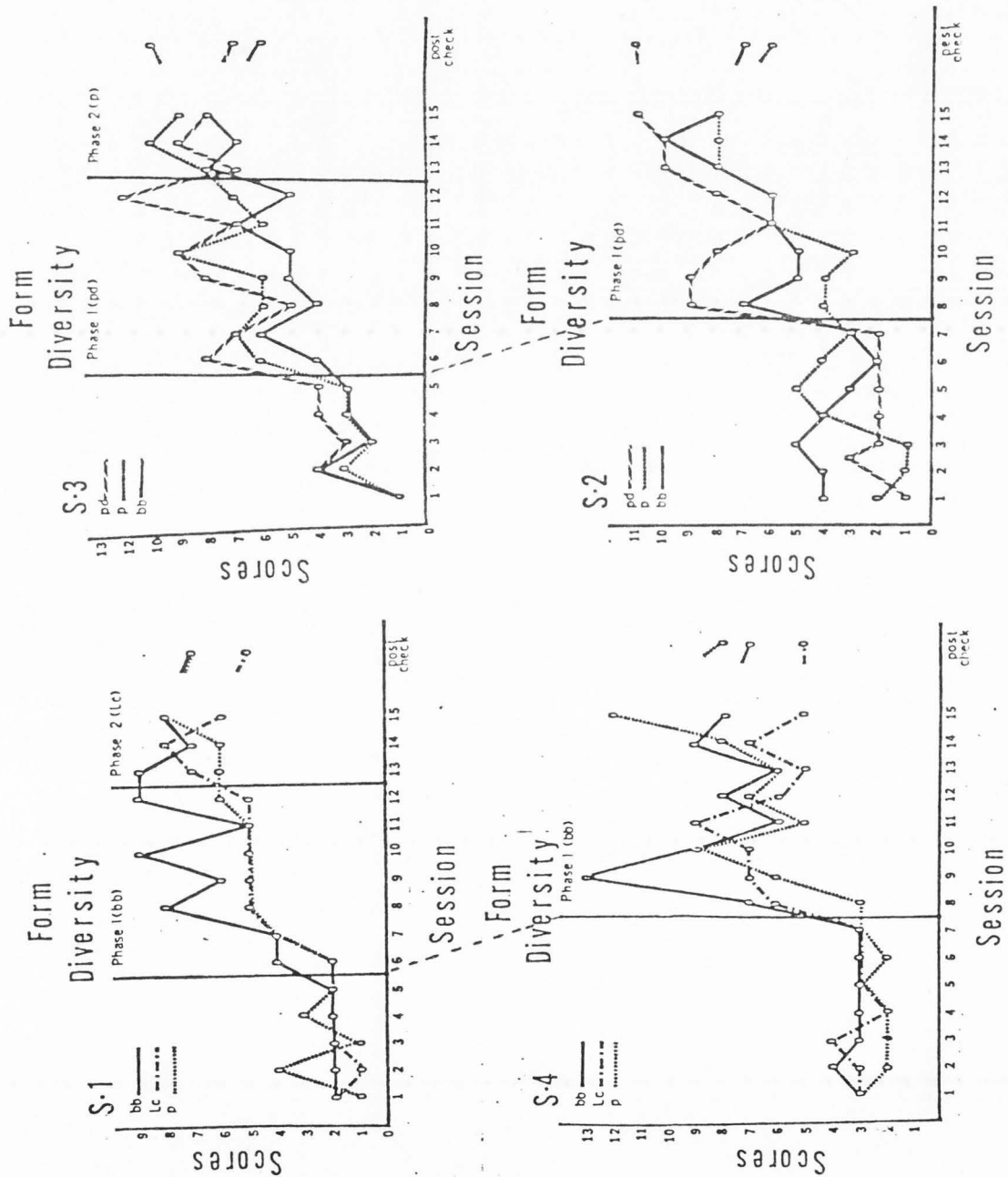


Figure 1. Form diversity scores produced by four preschool children's baseline and training conditions (See Appendix D for enlarged figures).

emerged in that session. These figures exclude the first baseline session as required by the definition of the new form score. As Figure 2 indicates, the emergence of new form production was largely restricted to sessions after the independent variable was applied. The changes in cumulative new forms of blockbuilding and pen drawing are seen quite clearly in Subjects One, Two, and Four (Figure 2). These changes in the cumulative new form score represent a sudden increase from a stable baseline. In Subject Three's case (Figure 2), the baseline of pen drawing new forms production was increasing when the training package was introduced. The rate of production of new forms subsequent to the advent of the training package could be interpreted as an extension of that increasing baseline. (See Figure 2 and Table 4.)

Generalization

Figure 1 clearly shows generalization in terms of daily form diversity scores noted by the accelerating scores of all children in all media both trained and untrained. The onset of the training package (Phase 1) in either blockbuilding or pen drawing produced allied changes in either Lego construction, painting, pen drawing, or blockbuilding. The generalization occurred in not only topographically similar media but also in topographically dissimilar media. For example, Subject One's mean (Figure 1) on form diversity was 2.0 during baseline; and during Phase 1, it increased to a mean of 7.0. Moreover, at approximately the same time as training in blockbuilding, Lego

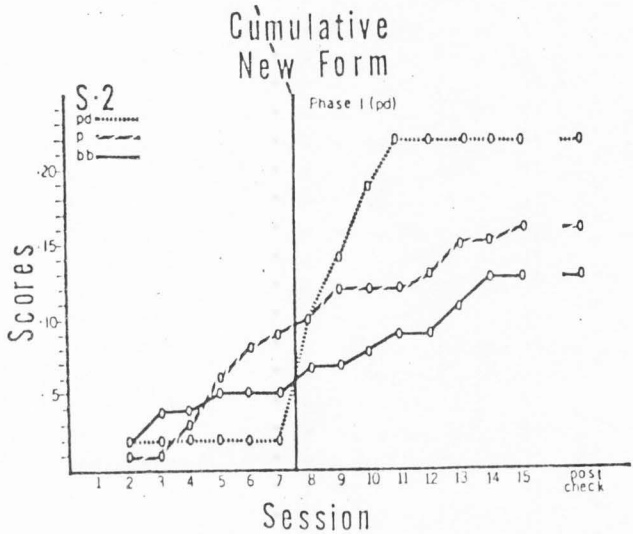
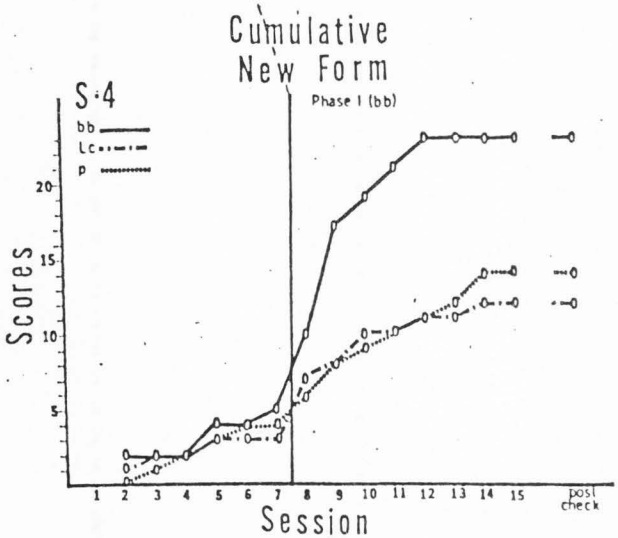
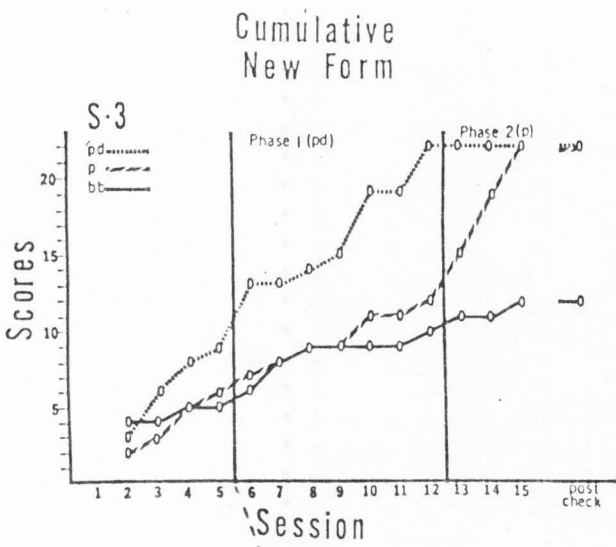
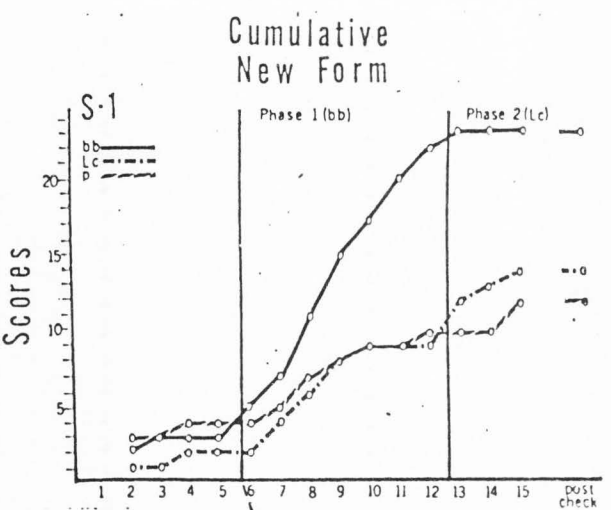


Figure 2. Cumulative new form scores produced by four preschool children's baseline and training conditions (See Appendix D for enlarged figures).

construction increased an average of 2.6 diverse forms per session. Painting, a topographically dissimilar medium, increased an average of 2.4 diverse forms per session.

In terms of cumulative new form scores, generalization was demonstrated for Subjects One and Four (Figure 2). This was true not only for topographically similar media (Lego construction) but also for topographically dissimilar media (painting). For example, Subject Four's Lego score in baseline phase averaged three new forms per session while during Phase 1, the reinforcement and modeling of new and novel blockbuilding forms, Lego production increased to an average score of 1.1 per session. At the same time, painting averaged 0.4 new forms per session during baseline while during Phase 1 of blockbuilding, the painting score increased to a mean of 1.2 new forms per session. (See Tables 3 and 4).

In Subject Two's (Figure 2) case, the baselines on pen drawing (manipulated medium) and blockbuilding were stable. However, the baseline on painting was increasing. Generalization across topographically dissimilar media was observed but the rate of new form production in painting, a topographically similar medium, could be interpreted as an extension of that baseline rather than a change from it.

As for Subject Three (Figure 2), blockbuilding (probe) was the only medium that achieved stability. Scores on both pen drawing and painting media were increasing during baseline and the training (Phase 1) cannot be construed as affecting the emergence of new forms.

Table 3
Mean Number of Diverse Forms Produced by Four
Preschool Children's Baseline and Training Conditions

Children	Baseline	Training Blockbuilding	Training Lego Construction
S ₁			
blockbuilding	2.0	7.0	7.0*
Lego construction	1.8	4.4	7.0
painting	2.2	4.6	6.7
S ₄			
blockbuilding	3.1	8.3	**
Lego construction	3.0	6.5	**
painting	2.4	7.0	**
	Baseline	Training Pen Drawing	Training Painting
S ₂			
pen drawing	2.0	9.0	**
painting	2.9	5.8	**
blockbuilding	3.6	6.9	**
S ₃			
pen drawing	3.2	8.0	7.0*
painting	2.4	6.7	9.0
blockbuilding	2.6	5.1	7.7

*Return to baseline conditions

**Training was not instigated

Figure 2 reveals during Phase 2, the training package (social reinforcement and modeling) was contingently applied to the medium of painting. The result was an increase in new form production in the medium of painting. The result was an increase in new form production

Table 4
Mean Number of Cumulative New Forms Produced by
Four Preschool Children's Baseline and Training Conditions

Children	Baseline	Training Blockbuilding	Training Lego Construction
S_1			
blockbuilding	0.2	2.9	0.0*
Lego construction	0.2	1.0	1.7
painting	0.2	0.8	0.7
S_4			
blockbuilding	0.5	2.2	**
Lego construction	0.3	1.1	**
painting	0.7	1.2	**
	Baseline	Training Pen Drawing	Training Painting
S_2			
pen drawing	0.0	3.3	**
painting	1.3	0.9	**
blockbuilding	0.5	1.0	**
S_3			
pen drawing	1.5	1.3	0.0*
painting	1.0	0.9	3.3
blockbuilding	0.2	0.7	0.7

*Subject reached maximum number of forms as defined in the study

**Training was not instigated

in the medium of painting accompanying the training of both pen drawing and painting. The length of the blockbuilding probe in Phase 2 allowed little support to the generalization phenomena.

Post Check

A three week post check showed that all children maintained their high level of form diversity when compared to baseline. The maintenance was in trained media, topographically similar media, and topographically dissimilar media. There were no new forms produced during the post check phase.

Table 5

The Number of Form Diversity and New Form Production by
Four Preschool Children During Post Check Phase

	Form Diversity	New Form Production
S_1		
blockbuilding	7	0
Lego construction	5	0
painting	7	0
S_2		
pen drawing	11	0
painting	6	0
blockbuilding	7	0
S_3		
pen drawing	7	0
painting	12	0
blockbuilding	6	0
S_4		
blockbuilding	7	0
Lego construction	5	0
painting	8	0

CHAPTER V

DISCUSSION

New form production and the generalization of diverse production to new media of expression would be a valuable contribution to educational curricular methods and generalization methodology. Holman, et al., (1977) have suggested that generalization may be possible across topographically similar media of expression. The study reported here examined the form diversity production and cumulative new form production in children using both descriptive social reinforcement and overt modeling. In addition, the study investigated the generalization of novel form production across topographically similar and dissimilar media of expression.

Form Diversity

The specific effects of descriptive social reinforcement or overt modeling, or some combination thereof, cannot be ascertained from the results. However, the combination of descriptive social reinforcement and overt modeling seems to be powerful in modifying form diversity. By using a multiple baseline across four individuals, it was possible to note a change in the operant level of specific tasks (e.g., blockbuilding, pen drawing, painting, Lego construction) upon the application of the training package. The daily form diversity score

increased when training was contingently applied to that task. This type of pattern is consistent with other work employing descriptive social reinforcement and blockbuilding form diversity production (Goetz & Baer, 1971, 1972); easel painting form diversity production, (Goetz & Salmonson, 1972); and felt pen form diversity production (Fallon & Goetz, 1975).

New Form

Cumulative new form scores on the trained medium increased as a function of training. However, in Subject Three's case, the baseline of new form production increased steadily and the rate of invention of new forms subsequent to training on form diversity could be interpreted as an extension of her baseline rather than a change from it.

However, the emergence of new painting forms during Phase 2 training (reinforcement and modeling) revealed new form production at an average of 3.3 per session, while the emergence of new forms during the baseline session was a mean of .8 per session.

It seems clear at this point that the concepts of form diversity and new form production when trained as operant behaviors can be produced among young children. This study, combined with other studies in the area of form diversity and new form production, has shown that expressive media (blockbuilding, painting, Lego construction, and pen drawing) are amenable to behavior analysis.

It may be noted that the training phases were applied to both form diversity and new form production. Changes in form diversity and in new forms were a result of descriptive and modeling contingencies applied to each new form. These changes taken together suggest that children receiving training in a medium do display form diversity within a session and emergence of new forms across sessions. However, the behavior change seen in the trained media cannot be labeled original or creative. The behavior change could not be original due to overt modeling by the trainer and direct reproduction of the form by the child.

In terms of a daily form diversity score, the transfer of a response to topographically similar and dissimilar objects was demonstrated in all four subjects. At the time of training in either block-building or pen drawing, collateral changes occurred in topographically similar and dissimilar media (i. e., lego construction or painting). Generalization across tasks represents evidence of novel production. Furthermore, the interpretation of generalization to a non-trained media (topographically similar or dissimilar) supports the concept of originality or creativity. The data presented and the accompanying training procedures not only contribute to correlated changes in form diversity scores and new form production, but also add to a generalization methodology that produces transfer in non-trained form diversity media.

Although generalization across form diversity media was seen, generalization to new form production was not obtained. It is possible

that the child, during training, conceives and generalizes the task in a manner that reflects repeated production of the same forms throughout the sessions. It should be noted, however, that the concept of generalization or "training to generalize" (Stokes & Baer, 1977) in cumulative new form productions was shown clearly in Subjects One and Four in all media. Subjects Two and Three evidence some generalization. However, the lack of stability in an untrained medium (painting in each case) makes the emergence of new form production in that medium difficult to interpret. Moreover, it is also true that Subject Three did not achieve stability in the trained medium on cumulative new form production. Further analysis of Phase 1, the training of blockbuilding medium, reveals that generalization in both form diversity and new form production is recognizable from Lego construction to painting production (topographically similar and dissimilar tasks). Trained pen drawing and accompanying generalization in new form production was not as visible in the medium of painting (a topographically similar task). The lack of clarity was due to the accelerating baseline of either pen drawing or painting. Whether the difference in the new form production and the cross medium generalization was due to the topography of the task or the idiosyncrasies in children is beyond the scope of this study.

Phase 2 was designed to increase the likelihood of generalization to a topographically dissimilar medium. Since two subjects showed substantial generalization, Phase 2 was not applied. However, Phase

2 was applied to two other subjects, and at the onset of training two events occurred: (a) The trained (Phase 1) medium reversed back to baseline conditions, and (b) the training began a new medium. In this multiple baseline design, functional relationships cannot be assumed when two or more variables are manipulated at the same time (Hersen & Barlow, 1976). The conclusions that could be drawn from the data in Phase 2 are of dubious value due to not only the statement above but also to an insufficient number of sessions.

Response maintenance is an important aspect of generality of behavior changes. Response maintenance was observed in this study during the post check phase three weeks after the completion of the study. All four subjects maintained their high level of form diversity in all media. Moreover, no new form productions were observed during the post check phase.

Generalization of Creative Behaviors

The need for generalization has been frequently stressed in the literature. However, only recently has it recieved the attention it deserves (Holman, et al., 1977); Stokes & Baer, 1977). The development, maintenance, and generalization of behavior changes are important aspects to consider in the establishment of a generalization methodology. The major tasks in identifying a generalization methodology are (1) extracting common elements in the methodology, and (2) establishing a mode of exploration, e.g., as bar pressing studies

were the mode of exploration for operant theory (Holman, et al, 1977). Research aimed at the concept of creativity (defined as generalization from an individual's behavior repertoire) could play an important role as the mode for exploration in the development of a generalization methodology.

Recently, Stokes and Baer (1977) have outlined nine classifications for the generalization phenomena. Their final classification "training to generalize" seems to be germane to this study when one considers generalization as a response. If generalization is a behavioral response, then a reinforcement contingency may be applied in the same manner as any other operant. Perhaps the best explanation for the generalization seen in this study is the attending to or the training of a broad response class. The instruction of a "rule" to produce new or different forms may contribute to a behavior diversity and diversity may already exist on a generalization gradient. In the area of creativity, other studies typically have not found generalization to similar or dissimilar media. Holman, et al., (1977) found that generalization across tasks was somewhat variable, inconsistent, and usually of limited magnitude. They utilized descriptive social reinforcement as their independent variable. Zimmerman and Dialessi (1973), Zimmerman and Rosenthal (1972), and Arem and Zimmerman (1976) used overt models either by personal presentation or video tape. They found generalization to characteristics within the same medium. In contrast, the present study combined descriptive social reinforcement and overt modeling

to produce a training package. It is the opinion of this author that overt modeling, i. e., demonstration and instruction, helped the subject attend to a broad response class. Specifically, ". . . Now I want you to make something new or different," the instruction of the rule, was the event that produced generalization to new or different forms. For the purpose of this study, Stokes and Baer's (1977) "training to generalize" category has identified the essence of a generalization methodology.

However, it was not the intent of this study to identify the most salient training variable contribution to the generalization phenomena, but rather to observe the occurrence of generalization to topographically similar and dissimilar media. Creativity devised by novel production or original behavior has been subjected to experimental analysis within the limits of this study.

The practical implication of this study is relevant for educational curriculum in creativity, as well as for behavior therapy programs. It bears a very special significance for the treatment of severely deviant populations, such as retarded children. These children do not display deficits which are single, isolated, or which consist of limited skills, but rather they show extreme deficits in developmental behaviors. When children are confronted with extensive behavioral deficits and excesses, it would seem of limited value to pursue the "one behavior at a time" application of behavior principles. On the other hand, it would seem wise to develop procedures which

produce wide spread behavior change. That is development of a generalization methodology, wherein the application of a training package for one behavior produces predictable and reliable changes in other behaviors, is needed (Rincover & Hayes, 1977).

In conclusion, it must be noted that the present study raises more questions than it answers. Form diversity production was demonstrated to be related to the training phase. Various researchers have demonstrated relationships between training (descriptive social reinforcement or overt modeling) and novel production (Holman, et al., 1977; Goetz, et al., 1971, 1972, 1975; Zimmerman, et al., 1976). However, this study is the first to identify the necessary and sufficient conditions responsible for the change. Only when such data are available can a more exact explanation be given to the influence of the training phases.

Another question raised by the study has to do with the characteristics of topographically similar and dissimilar media. The analysis of the media characteristics needs to be addressed in a more objective manner. How much more are blockbuilding and Lego construction similar in their construction elements than pen drawing and painting? Why did this study find no difference between production characteristics with regards to topographically similar or dissimilar media?

Finally, the generalization observed in this study could be referred to as training to generalize. If the effects of that training (or instruction) are themselves to become generalized yielding a "generalized generalizer"

(Stokes & Baer, 1977), perhaps it is an elaborate version of "rule governed behavior." It is obvious that more research is needed to clarify the "generalized generalizer" phenomena observed in form diversity and new form production studies. When such data are available, the research in creativity or originality can contribute more to the developmental of a generalization methodology.

REFERENCES

- Arasteh, R. A., & Aresteh, J. D. Creativity in Human Development. New York: Schenkman Publishing, 1977.
- Arem, C. A., & Zimmerman, B. J. Vicarious effects on the creative behavior of retarded and nonretarded children. American Journal of Mental Deficiency, 1976, 81, 289-296.
- Ascione, F. R. The effect of continuous nurturance and nurturance withdrawal on children's behavior: a partial replication. Child Development, 1975, 46, 790-795.
- Baer, D. M., Wolf, M. M., & Risley, T. R. Some current dimensions of applied behavior analysis. Journal of Applied Behavior Analysis, 1968, 1, 91-97.
- Corte, H. E., Wolf, M. M., & Locke, B. J. A comparison of procedures for eliminating self injurious behaviors of retarded adolescents. Journal of Applied Behavior Analysis, 1971, 4, 201-213.
- Crockenberg, S. B. Creativity tests: A boon or boondoggle for education? Review of Educational Research, 1972, 42, 27-45.
- Fallon, M. P. The creative teacher: the effects of descriptive social reinforcement upon the drawing behavior of three preschool children. School Application of Learning Theory, 1975, 7, 27-45.
- Fleigler, L. A. Levels of creativity. Educational Theory, April, 1959, 9, 115.
- Garcia, E. The training and generalization of a conversational speech form in non-verbal retardates. Journal of Applied Behavior Analysis, 1974, 7, 137-149.
- Ghiselin, B. (Ed.) The Creative Process. New York: The New American Library, 1955.
- Glover, J., & Gary, A. L. Procedures to increase some aspects of creativity. Journal of Applied Behavior Analysis, 1976, 9, 79-84.
- Goetz, E. and Baer, D. M. Social reinforcement of "creative" block-building by young children. In Eugene A. Ramp and Bill L. Hopkins (Eds.). A New Direction for Education: Behavior Analysis 1971. Lawrence Kansas: The University of Kansas Support and Development Center for Follow Through, 1971.

- Goetz, E. M., & Baer, D. M. Social control of form diversity and the emergence of new forms in children's blockbuilding. Journal of Applied Behavior Analysis, 1973, 6, 209-217.
- Goetz, E. M., & Salmonson, M. M. The effect of general and descriptive reinforcement on "creativity" in easel painting. In G. B. Smith (Ed.), Behavior Analysis in Education, Lawrence, Kansas: University of Kansas Printing Service, 1972.
- Goetz, E. M., Thomson, C. L., and Etzel, B. C. An analysis of direct and indirect teacher attention and primes in the modification of child social behaviors: a case study. Merrill-Palmer Quarterly, 1975, 21, 55-65.
- Guess, D., Sailor, W., Rutherford, G., & Baer, D. M. An experimental analysis of linguistic development: the productive use of the plural morpheme. Journal of Applied Behavior Analysis, 1970, 3, 273-287.
- Guilford, J. P. Creativity, American Psychologist, 1950, 5, 444-454.
- Guilford, J. P. The Nature of Human Intelligence. New York: McGraw-Hill, 1967.
- Guilford, J. P. Some recent findings on thinking abilities and their implications. Information Bulletin, 1952, 3, 48-61.
- Guilford, J. P. Traits of creativity. In H. H. Anderson (Ed.), Creativity and Its Cultivation. New York: Harpers, 1959.
- Guilford, J. P. Three faces of intellect. The American Psychologist, 1959, 14, 469-479.
- Guilford, J. P. Intelligence, Creativity and Their Educational Implications. San Diego, California: Robert R. Knapp, 1968.
- Haskett, G. J., & Lenfestey, W. Reading-related behaviors in an open classroom: effects of novelty and modeling on preschoolers. Journal of Applied Behavior Analysis, 1974, 1, 233-241.
- Hersen, M., & Barlow, D. Single Case Experimental Designs. New York: Pergamon Press, 1976.
- Holman, J., Goetz, E. M., & Baer, D. M. The training of creativity as an operant and an examination of its generalization characteristics. In B. C. Etzel, J. M. LeBlanc, & D. M. Baer (Eds.), New Developments in Behavioral Research: Theory, Method, and Application. Lawrence, Kansas: Lawrence Erlbaum Associates, 1977.

- Jones, B., & Alexander, R. Developmental trends in auditory visual cross model matching of spatio temporal patterns. Developmental Psychology, 1974, 10, 354-356.
- Kale, R. J., Kaye, J. H., Whelan, P. A., & Hopkins, B. L. The effects of reinforcement on the modification, maintenance, and generalization of social responses of mental patients. Journal of Applied Behavior Analysis, 1968, 1, 307-314.
- Kneller, G. F. The Art and Science of Creativity. New York: Holt, Rinehart, and Winston, 1965.
- Maloney, K. B., & Hopkins, B. L. The modification of sentence structure and its relationship to subjective judgements of creativity in writing. Journal of Applied Behavior Analysis, 1973, 6, 425-433.
- Maltzman, I. On the training of originality. Psychological Review, 1960, 67, 229-242.
- Maltzman, I., Bogartz, W., and Breger, L. A procedure for increasing word association, originality, and its transfer effects. Journal of Experimental Psychology, 1958, 56, 392-398.
- Maltzman, I., Simon, S., Raskin, D., & Licht, L. Experimental studies in the training of originality. Psychological Monographs, 1960, 74, 274-283.
- Osborn, A. F. Applied Imagination. New York: Scribner, 1957.
- Parnes, S. J., & Meadow, A. Effects of "brainstorming" instructions on creative problem solving course. Psychological Reports, 1960, 57, 357-361.
- Passow, H. A. Fostering creativity in the gifted child. Exceptional Children, 1977, 43, 358-364.
- Powers, R. B., & Osborne, J. G. Fundamentals of Behaviors. St. Paul: West Publishing Company, 1976.
- Pryor, K. W., Haag, R., & O'Reilly, J. The creative porpoise: training for novel behaviors. Journal of the Experimental Analysis of Behavior, 1969, 12, 653-661.
- Rand, C. W. Copying in drawing: the importance of adequate visual analysis versus the ability to utilize drawing rules. Child Development, 1973, 44, 47-53.
- Reese, H. W., & Parnes, S. J. Programming creative behavior. Child Development, 1970, 41, 413-423.

- Rincover, Arnold, & Hayes, Steven C. Technologies for promoting response - Response generalization. Paper presented at the meeting of the American Psychological Association, San Francisco, August, 1977.
- Sidman, J. Tactics of Scientific Research. New York: Basic Book Publishers, 1960.
- Silver, J. R., & Rollins, H. A. The effects of visual and verbal feature emphasis on form discrimination in preschool children. Journal of Experimental Child Psychology, 1973, 16, 205-216.
- Slosson, E. E., & Downey, J. E. Plots and Personalities. New York: Century, 1922.
- Stokes, Trevor F., & Baer, Donald M. An implicit technology of generalization. Journal of Applied Behavior Analysis, 1977, 10, 349-367.
- Striefel, S., Bryan, K. S., & Aikins, D. A. Transfer of stimulus control from motor to verbal stimuli. Journal of Applied Behavior Analysis, 1974, 7, 123-135.
- Striefel, S., & Wetherby, B. Instruction-following behavior of a retarded child and its controlling stimuli. Journal of Applied Behavior Analysis, 1973, 6, 663-670.
- Striefel, S., Wetherby, F., & Karlan, G. R. Establishing generalized verb-noun instruction-following skills in retarded children. Journal of Experimental Child Psychology, 1976, 22, 247-260.
- Torrance, E. P. Torrance Tests of Creative Thinking: Technical Norms Manual. Lexington, MA: Personne Press, 1960.
- Tyrrell, D. J. Cross model transfer of conceptual responding in children. Bulletin of the Psychonomic Society, 1974, 4, 269-271.
- Ward, W. C., & Kogan, N. Incentive effects in children's creativity. Child Development, 1972, 43, 669-679.
- Zimmerman, B. J., & Dialessi, F. Modeling influences on children's creative behavior. Journal of Educational Psychology, 1973, 65, 127-134.
- Zimmerman, B. J., & Rosenthal, T. L. Conceptual generalization and retention by young children: age, modeling, and feedback effects. The Journal of Genetic Psychology, 1974, 125, 233-245.

Zimmerman, B. J. and Pike, E. O. Effects of modeling and reinforcement in the acquisition and generalization of question-asking behaviors. Child Development, 1972, 43, 892-907.

APPENDIXES

Appendix A: Letter and Consent Form

Date

Dear Parent:

As part of a project designed to gain a better understanding of creative development in young children, we are requesting that you allow your child to participate in a simple study.

Briefly, it will involve training your child novel ways to play with blocks, Legos, pen drawings, and/or painting. Your child will be trained by using social descriptive reinforcement and/or adult modeling for novel construction. After the training phase, the same day we'll ask your child to play with one of the above mediums that she has not been trained.

Our basic purpose will be to document the generalization from training in one medium to another medium in children from ages 3-5. When the data has been collected and analyzed (approximately 20-25 days), we will send you all pictures which your child has made. In addition, if you would like to meet with me to discuss the study, this can be arranged. If you have any questions, please call Craig Boswell at 753-3420.

Your prompt return of the enclosed form will be appreciated.

Sincerely,

Craig Boswell, Director
Developmental Day School

CB/bb

Enclosure

In order to protect the confidentiality of the students' scores, each child will be assigned a number. These numbers, instead of the names, will appear on the children's data sheets. After the data have been collected, the list showing which numbers had been assigned to which child will be destroyed, thus making it impossible to determine which score belongs to which child.

I hereby allow my child to participate in the creative development study. I understand that my child will be trained on novel form construction and asked to play with different forms of media the same day. It is my understanding that all pictures will be returned to me when the study is completed.

Witness

Parent's Signature

Date

Address

Phone

Please include your address and phone number so that the pictures produced by your child may be returned to you.

Appendix B: Form Definitions

Felt Pen Drawing Code

+CIRCULAR ENCLOSURE: any nearly enclosed or enclosed curve including circles, ovals, ellipses, etc. with a diameter of at least 1 1/2" at its widest point. The form may be pointed at one end.

CROSS: two lines which intersect each other, making a cross like formation and meeting the following requirements.

1. If the lines are of relatively equal length the angle of intersection is arbitrary, but the lines must intersect at relatively the same point on each line.
2. If the lines are not of equal length, the angle of intersection must be relatively close to 90°.

CURVE: a line or part of any line, at least 3" long continuously bent so that no portion of it is straight. All circulars get credit for curve.

DIAGONAL LINE: a relatively straight line, at least 3" long forming a 10° to 80° angle.

DUPLICATE FORM: a relatively exact pair of forms clearly seen as a design, or any of the crossed (+) forms. The size and color may vary but the structure should be essentially the same. Simple forms such as circles require more exactness than more complex forms, such as an irregular enclosure or a simulation. A staccato grouping itself is not a duplicate: the same grouping must be repeated in another area of the paper.

HORIZONTAL LINE: a relatively straight line, at least 3" long, forming a 0° to 10° angle.

+IRREGULAR ENCLOSURE: any enclosed or nearly closed unsymmetrical line formation leaving a center area with a diameter no smaller than 1 1/2" at its widest point.

+LAYER OF COLORS: three or more repeated lines, using two or more different colors, which lie side by side. Each line should be a different color than the one beside it. To be counted as a duplicate, the two groups of layers must contain the same colors, and must be separated by at least 3" of space.

MASS: any combination of lines in a manner that results in a solid colored area at least 1" square. No uncolored area may be larger than 1/4" at its widest point.

+OVERLAPPING SAME FORMS: a Duplicate with one form overlapping the other at any point.

+PATTERN: three or more duplicate forms. No member of a pattern may be over 3" away from another member.

RECTANGULAR: any nearly enclosed form with 4 relatively straight lines (sides) and 4 90° angles, approximate to within 10° . Two sides must be no smaller than 2" and 2 sides must be no smaller than $1\frac{1}{2}$ " in length.

+SIMULATION: a configuration which resembles a real-life object. Symbols are excluded. To be scored as such, the form must be labeled explicitly by the child and be recognizable to the observer; or two observers must agree.

SPATTER: using the felt pen by tapping firmly on the paper until the tip is excessively lubricated so that each additional tap spatters tiny dots of ink onto the sheet.

+SPIRAL: a winding or coiled line which must include at least two consecutive, complete revolutions.

+SPIRAL CHAIN: at least two spirals connected by a line which may be straight or curved.

+STACCATTO: three or more dashlike particles, all within a 3" area of each other. They may or may not overlap but must be no larger than $1\frac{1}{2}$ ".

STACCATTO LINE: a line of at least four dashlike particles following each other (not clumped together).

+SYMBOL: any configuration which represents anything other than a simulation, numbers, letters, signs, etc.

+TINKER TOY LINE: circular forms with one or more straight lines connecting them. The connecting line must be at least 1" long from diameter to diameter. The connecting line may project into but not beyond the circular form unless it is connected to an additional form.

+TRAIN OF COLORS: a series of 3 or more lines using 2 or more colors forming a line of procession. The colors need not be touching but must be within $1\frac{1}{4}$ " of each other. The train need not consist only of lines, but can include areas of color, providing they are arranged in train formation.

+TRIANGULAR: any enclosed form with only 3 sides and 3 angles. At least 2 sides must be $1\frac{1}{2}$ " long with the third side at least 1" long.

UNDULATING LINE: a line with 3 or more consecutive curves at least $\frac{1}{2}$ " deep. No part of the undulating line may overlap or touch itself at any point.

VERTICAL LINE: any relatively straight line, at least 3" long and forming an angle between 80° and 100° .

ZIGZAG: A line or any part of a line with three or more consecutive angles formed by turning the pen first one way, and then the other. The angle must be fairly sharp. A zigzag cannot overlap itself.

Lego Code

ARCH: any placement of a block atop two lower blocks not touching each other.

ARCH (Storied): an arch built exactly upon another arch.

ARCH (Multiple): any placement of blocks atop three or more lower blocks not touching each other forming at least two arches on the same level.

CORNER: any block stacked on a longer block so that both sides of each block are flush with each other; one end of each block flush with the other.

CORNER (Half): any small block stacked atop a longer block, one end of each block flush and one side of each block flush.

CORNER (Inverted): any corner having the longer block on top.

CROSS: any two blocks stacked so that at least one quarter of the top block extends over each side of the bottom block, forming a T or an X.

ENCLOSURE (Complete): any arrangement of extensions to enclose an open area. May or may not have a gate.

ENCLOSURE (Partial): any arrangement of extensions to enclose an open area (with at least three sides) and an opening equivalent to, or larger than, the largest block used.

EXTENSION: any combination of two or more blocks laid end-to-end on the same plane so the end of one block is butted against the end of the second block, or so the side of one block touches one side of the second block.

EXTENSION (Right Angled): any extension having at least one right angle, where the end of one block is flush with the side of the second block, and both blocks are on the same plane.

EXTENSION (Storied): any extension which is over one level high, and having two or more blocks on the same level.

FLOOR: two or more blocks arranged so the side of the first block touches more than half of the side of the second block.

FLOOR (Double): a floor placed atop another floor.

PROJECTION: any block protruding from either side of a second block, or from an extension, when neither side of the projecting block is flush with the end of the extension block. Also when a corner of the projecting block is touching a side of the extension.

SIMULATION: any construction of blocks which resembles a real-life structure, and is explicitly named by the child.

STEP: two or more blocks stacked one on top of the other both sides flush, but the ends not flush.

STEP (Half Row): two or more blocks stacked one atop the other lengthwise so that one row of one block overlaps the other block. The ends may or may not be flush.

STEP (Inverted): two or more blocks stacked one on top of the other so that the top block overhangs the bottom block on both ends, with the side of both blocks flush.

STEP (Right Angled): any block stacked atop another block with a side and an end flush and forming a right angle.

STORY: two or more blocks of the same size built exactly one on top of the other.

SUBDIVISION: two or more enclosures in contiguity with one or more common blocks.

SYMBOL: any configuration which represents anything other than simulation, as a letter or number.

TREE: any block or extension having two or more projections, the projections being on the same plane.

Easel-Painting Code

BLENDED COLOR: any hue formed by mixing two or more pure or available colors onto the paper.

CIRCULAR: any nearly enclosed or enclosed curve including circles, ovals, ellipses, etc. with a diameter of at least 1 1/2" at its widest point. The form may be pointed at one end.

CROSS: two lines which intersect each other, making a crosslike formation and meeting the following requirements.

1. If the lines are of relatively equal length the angle of intersection is arbitrary, but the lines must intersect at relatively the same point on each line.
2. If the lines are not of equal length, the angle of intersection must be relatively close to 90°.

CURVE: a line or any part of a line, at least 3" long continuously bent so that no portion is straight. All circulars get credit for curve.

DIAGONAL LINE: a relatively straight line, at least 3" long, forming a 10° to 80° angle.

DUPLICATE: a relatively exact pair of forms clearly seen as a design or any of the crossed (+) forms. The size and color may vary but the structure should be essentially the same. Simple forms such as circles require more exactness than more complex forms, such as an irregular enclosure or a simulation. A staccatto grouping itself is not a duplicate; the same grouping must be repeated in another area of the paper.

HORIZONTAL LINE: a relatively straight line, at least 3" long, forming a 0° to 10° angle.

IRREGULAR ENCLOSURE: any enclosed or nearly enclosed unsymmetrical line formation leaving a center area with a diameter no smaller than 1 1/2" at its widest point.

+LAYER OF COLORS: three or more repeated lines, using two or more different colors, 1" or less in width, which lie side by side. Each line should be a different color than the one directly beside it and separated by no more than half an inch. To be counted as a duplicate, the two groups of layers must contain the same colors, and must be separated by at least 3" of space.

- MASS: any combination of strokes in a manner that results in a solid colored area of at least 2" square. No uncolored area may be larger than 1/2" at its widest point.
- +OVERLAPPING SAME FORMS: a duplicate with one form overlapping the other at any point.
- +PATTERN: three or more duplicate forms. No member of a pattern may be more than 3" away from another member.
- +RECTANGULAR: any nearly enclosed form with 4 relatively straight lines (sides) and 4 90° angles, approximate to within 10°. Two sides must be no smaller than 2" and the other two must be larger or equal.
- +SIMULATION: a configuration which resembles a real life object. Symbols are excluded. To be scored as such, the form must be labeled explicitly by the child and be recognizable to the observer; or two observers must agree.
- SPATTER: three or more scattered or dashed small particles of drops resulting from one swing of the brush (usually from flicking the wrist).
- +SPIRAL: a winding or coiled line which must include at least two consecutive complete revolutions. May not be buried when scored as a duplicate, though may be later.
- +STACCATTO: three or more quick dabs that are not the result of a spatter, clustered in the same area, within 3" of each other. They may or may not overlap.
- +SYMBOL: any configuration which represents anything other than simulation, numbers, letters, signs, etc.
- +TINKER TOY LINE: circular forms with one or more straight lines connecting them. The connecting line must be at least 1" long from diameter to diameter. The connecting line may project into but not beyond the circular form unless it is connected to an additional form.
- +TRAIN OF COLORS: a series of three or more lines, using two or more colors, forming a line of procession. The colors need not be touching but must be within 1/4" of each other. The train need not consist only of lines, but can include areas of color providing they are arranged in train formation.

+TRIANGULAR: any enclosed form with only 3 sides and 3 angles. At least 2 sides must be $1\frac{1}{2}$ " long with the third side at least 1" long.

TRICKLE: a flowing or falling drop in a small, broken or gentle stream at least 1" long (Usually results from allowing paint to drip off the brush).

UNDULATING LINE: a line with three or more consecutive curves approximately 1" or greater in depth. No part of the undulating line may overlap or touch itself at any point.

VERTICAL LINE: any relatively straight line, at least 3" long and forming an angle between 80° and 100° .

ZIGZAG: a line or any part of a line with three or more consecutive angles formed by turning the brush first one way and then the other. The angle must be fairly sharp. A zigzag cannot overlap itself.

Blockbuilding Code

- ADJUNCT: two or more forms connected by a fence; at least one of the forms must be an enclosure, subdivision, or a roof.
- ARCH: any placement of a block atop two lower blocks not in contiguity.
- ARCH (Storied): an arch built atop another arch.
- ARCH (Variation): a "true" arch made of two arcs leaning together, placed atop two supports.
- BALANCE: any story in which the upper block is at least four times as wide as the lower block.
- BALANCE (Elaborated): any balance in which both ends of the upper block contain additional blocks.
- CIRCLE: an arrangement of four arc-shaped blocks in contiguity to form a circle.
- CIRCLE (Half): two arc-shaped blocks placed end-to-end in contiguity to form a half-circle.
- CROSS: any two blocks stacked so that at least one-quarter of the top block extends over each side of the bottom block forming a T or an X.
- ENCLOSURE (Complete): any arrangement of fences which encloses an open area, with or without a gate.
- ENCLOSURE (Partial): any arrangement of fences (with at least three sides) which encloses an open area, but leaves an opening equivalent or greater than the largest block used in the arrangement.
- FENCE: any two or more blocks placed side by side in continuity; if not contiguous, then any three blocks placed at regularly spaced intervals in a straight line.
- FENCE (Arched): two V-shaped blocks placed side by side with only the base of the V's touching the floor and the arms in contiguity.
- FLOOR: any arrangement of at least two flat blocks serving as a basis for high building.

INTERFACE: an arrangement of two blocks with curved contours to fit precisely together, as a half circle into an arch-shaped block.

PILLAR: any story in which the lowest block is at least twice as tall as it is wide.

POST: any story in which the lowest block is at least twice as wide, and half as tall, as the upper block.

RAMP: a block leaned against another, or a triangular block placed contiguous to another simulating an inclined place.

ROOF: two or more slat-shaped blocks placed flat and side-by-side atop at least two supports; or arch-shaped if the sides (not ends) are contiguous.

RECTANGLE FROM TRIANGLE: an arrangement of two equal sized triangles; the hypoteneuses placed in contiguity to form a rectangle or square.

SIMULATION: a construction of blocks which resembles a real-life object and its explicitly labeled by the child as such, as a building, boat, or swimming pool.

S: an arrangement of four arc-shaped blocks in contiguity as two half-circles in simulate an S.

STORY: any two or more blocks placed one atop another, the upper blocks resting solely upon the lower.

SUBDIVISION: two or more enclosures in contiguity with one common block.

TOWER; any story of two or more blocks, each of which is at least twice as tall as it is wide.

TOWER (Alternating): three or more cylindrical blocks stacked atop each other in ascending or descending sizes.

WEDGE: two equal sized triangles placed with equal sides of the right angle in contiguity. Triangles rest on one side of the right angle. They may be one-half an inch apart.

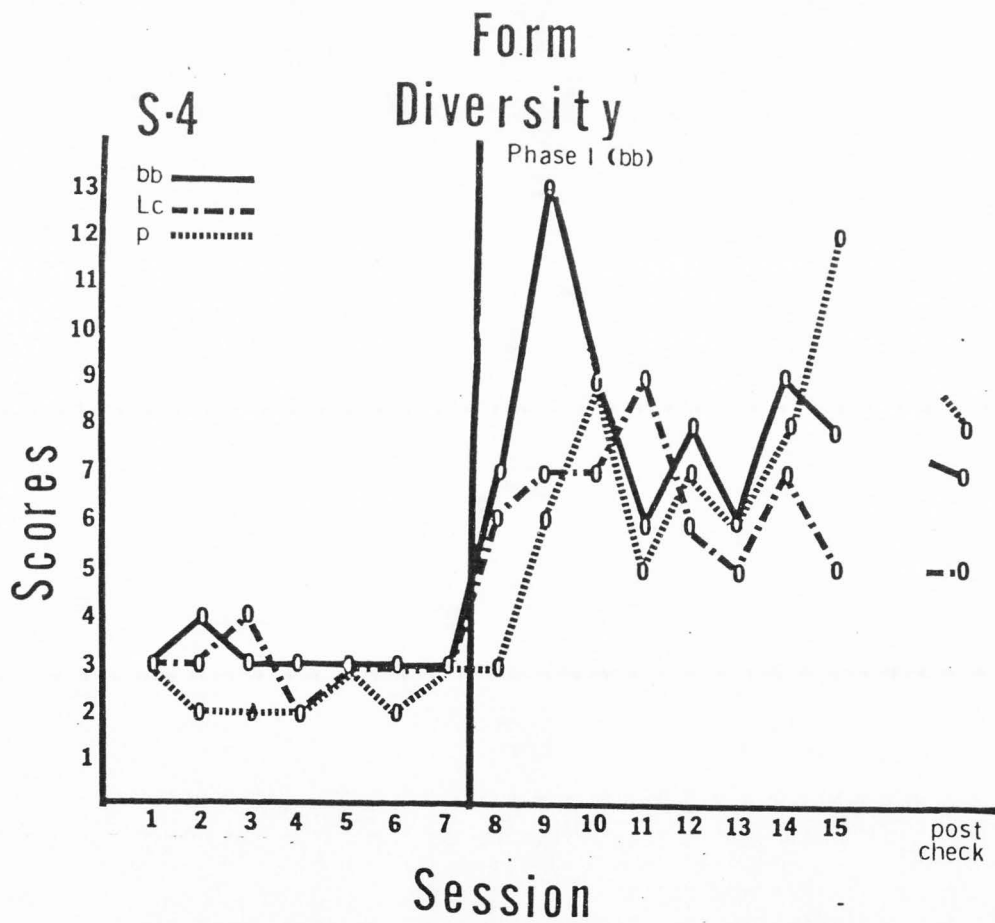
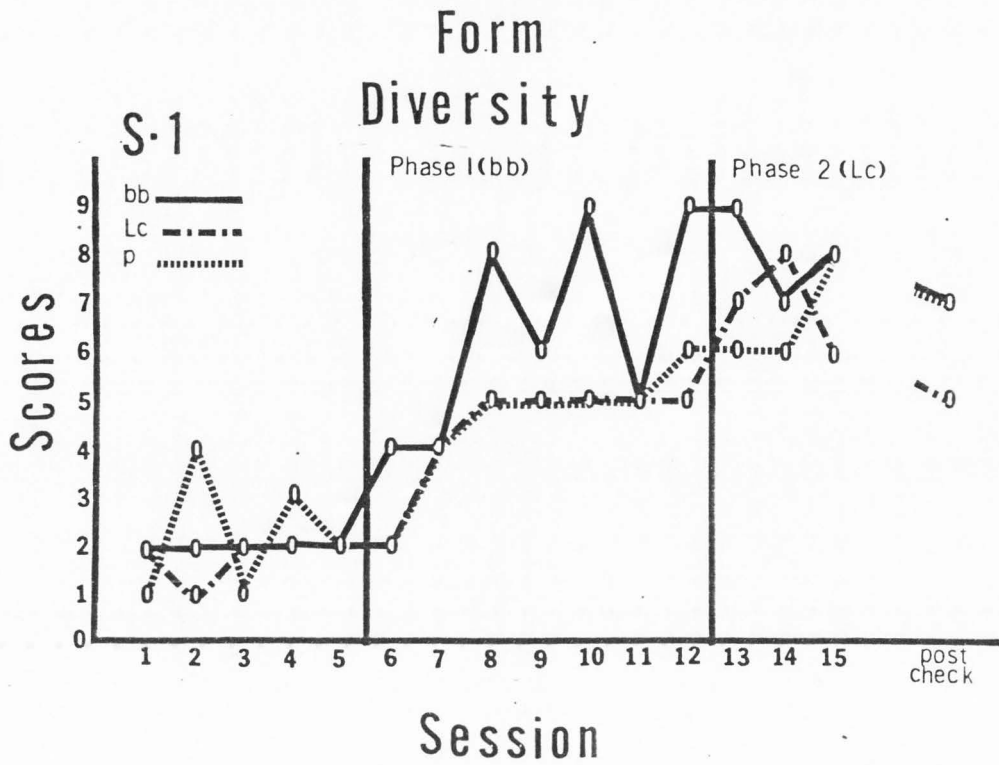
X: an arrangement of two V-shaped blocks in contiguity to simulate an X.

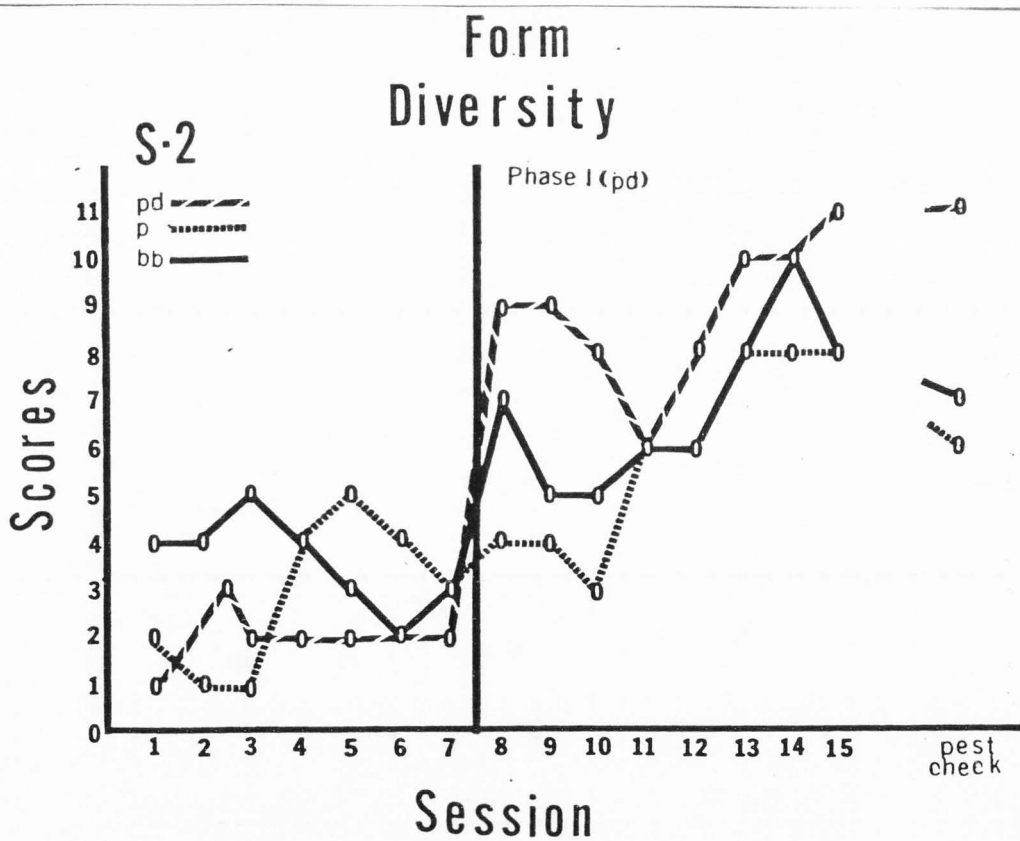
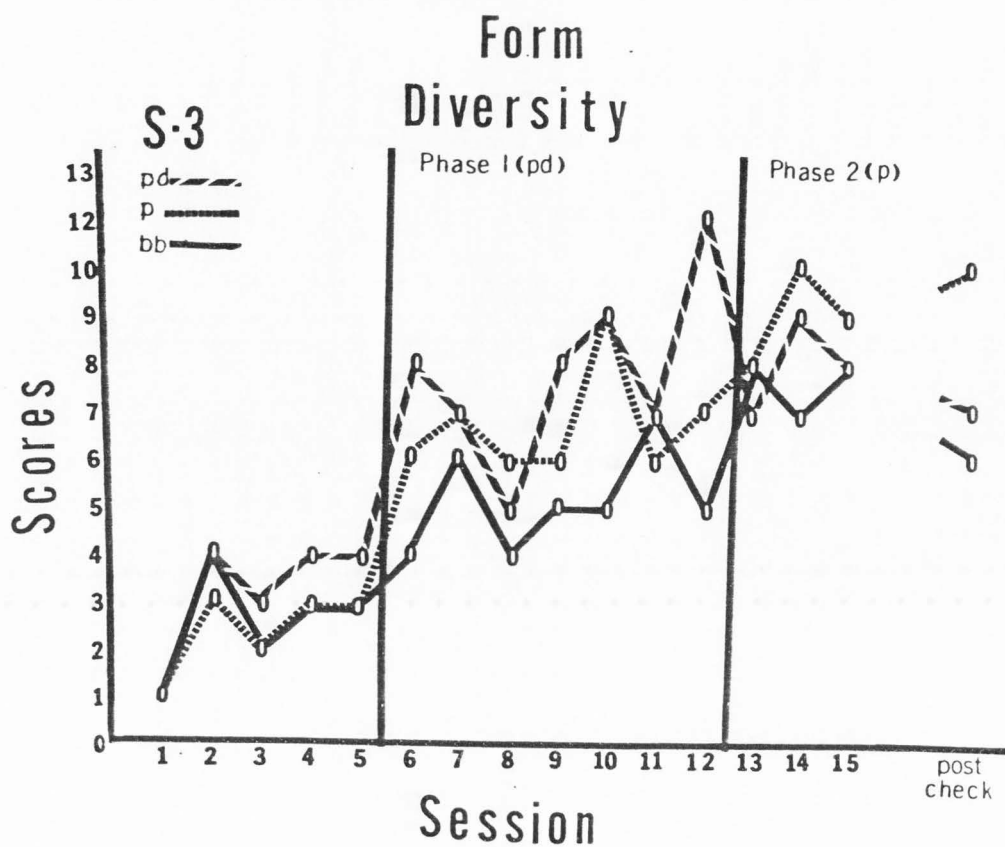
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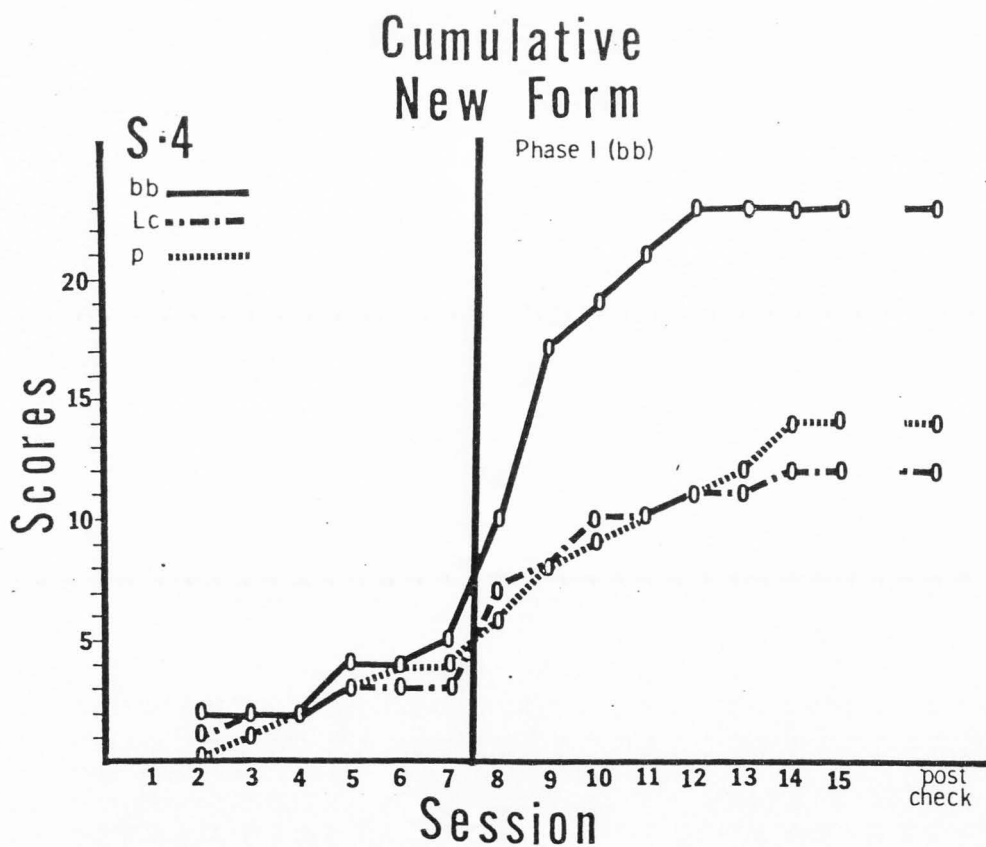
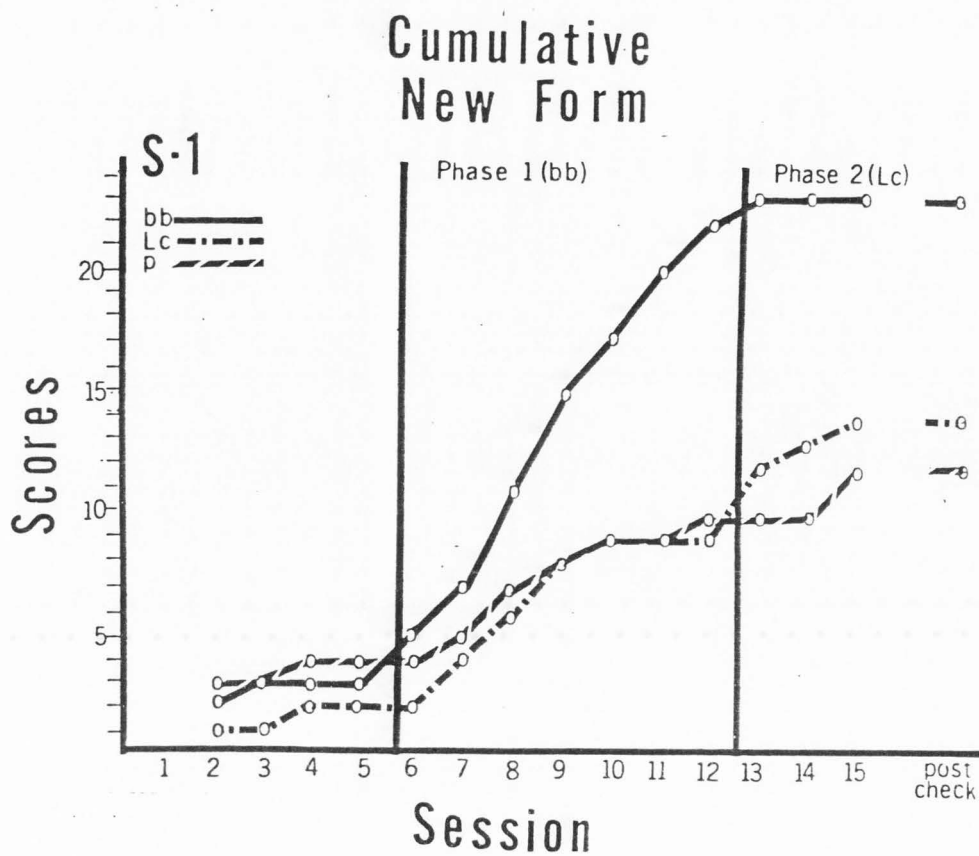
Blockbuilding Code

Adjunct:
Arch
Arch (Storied)
Arch (Variation)
Balance
Balance (Elaborated)
Circle
Circle (Half)
Cross
Enclosure (Complete)
Enclosure (Partial)
Fence
Fence (Arched)
Floor
Interface
Pillar
Post
Ramp
Roof
Rectangle from
triangle
Simulation
S
Story
Subdivision
Tower
Tower (alternating)
Wedge
X

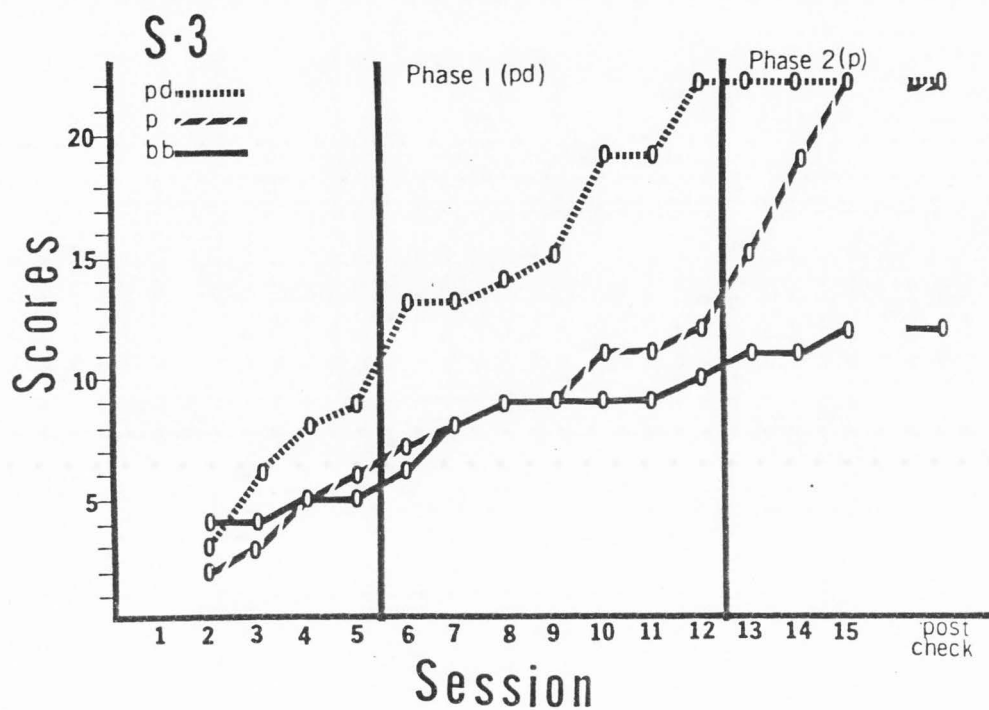
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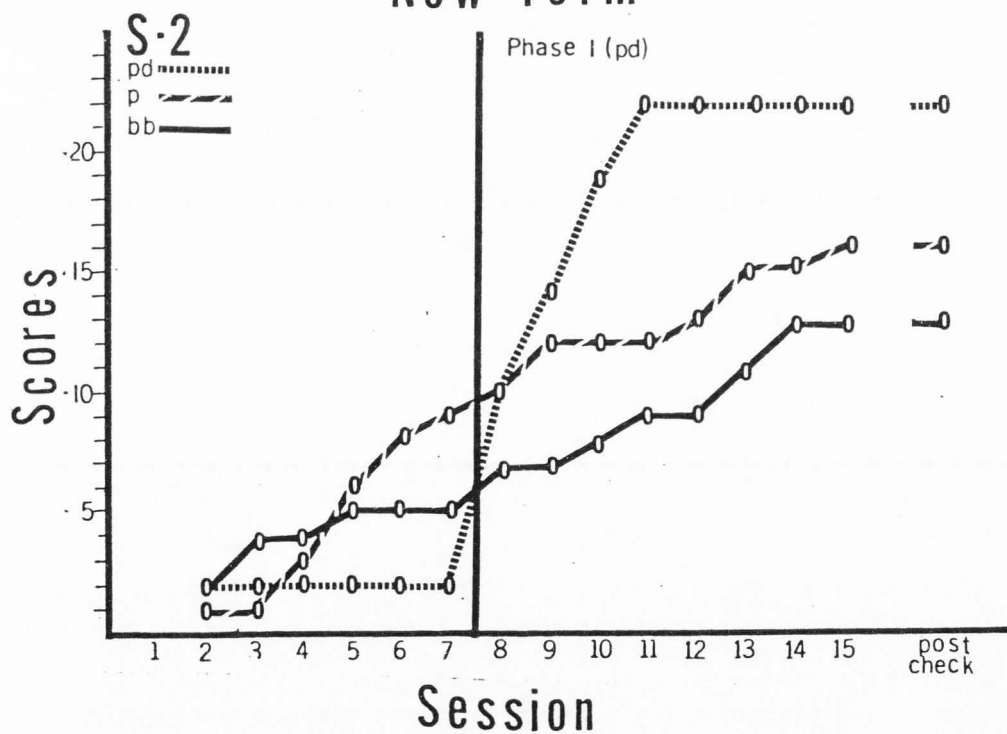




Cumulative New Form



Cumulative New Form



VITA

Craig B. Boswell

Candidate for the Degree of

Doctor of Philosophy

Dissertation: Generalization Characteristics of Form Diversity and
Novel Form Production Among Preschool Children

Major Field: Psychology

Biographical Information:

Personal: Born at Ogden, Utah, May 26, 1950, son of Leslie C. and Nina Beebe Boswell; married Rebecca A. Brown August 4, 1971; two children, Adam Craig and Nathan Scott.

Education: Attended elementary school in Ogden, Utah; graduated from Ben Lomond High School in Ogden, Utah in 1968; received the Bachelor of Science degree from Weber State College, with a major in Psychology, in 1972; received the Master of Science degree from Utah State University, with a major in Child Development, in 1973; completed requirements for the Doctor of Philosophy degree, with a major in Child Psychology, at Utah State University, in 1978.

Experience: Director/Owner, Developmental Day School, Inc., Logan, Utah, 1974 to present.

Instructor of Psychology and Special Education, Utah State University, Logan, Utah, 1975 to present.

Clinical Intern, Exceptional Child Center, Utah State University, Logan, Utah, 1974-1976.

Clinical Intern, Utah State Training School, American Fork, Utah, 1974-1975.

Certifications and Professional Affiliations: American Association on Mental Deficiency; National Association for the Education of Young Children; School Psychologist certification, Utah State Board of Education.

Presentations: "Recent Litigation and Applied Behavior Analysis," presented at the Rocky Mountain Psychological Association, Albuquerque, New Mexico, 1977.

"Experimental Study of Emotional Expression," presented at the Rocky Mountain Psychological Association, Albuquerque, New Mexico, 1977, with G. Casto.

"Outreach and Development/Preventive Program," presented at the American Psychological Association, Honolulu, Hawaii, 1972.

- Grants:
- "A Project to Develop and Validate a Due Process Hearing Workshop," C. Boswell and J. McLaughlin (Authors). Funded \$22,560.
 - "Experimental Study of Basic Emotional Expression," G. Casto and C. Boswell (Authors) Funded \$3,000.
 - "Skillbase Assessment Training Manuals," D. Morgan and C. Boswell (Authors) Funded \$1,500, 1978.
 - "Training Creative Behaviors to Mentally Retarded Children," C. Boswell (Author) Tentative - BEH - 1978.
 - "A Project to Develop and Validate a Due Process Hearing Precedent Manual," C. Boswell and J. McLaughlin (Authors). Not funded, 1976.
 - "Identification and intervention strategies for gifted Preschool Children," C. Boswell (Author). Working, 1978.
 - "Training Emotional Expression to Mentally Retarded Children," C. Boswell and G. Casto (Authors). Working, 1978.

Publications, Manuscripts, and Working Papers: Boswell, C.
Recent Litigation and Applied Behavior Analysis.
In Press. Educational Research Information Center.

_____, Novel Form Production and Generalization Characteristics. In review. Journal of Gifted and Talented.

_____, Training Creative Behaviors to Mentally Retarded Children.

_____, Sex education needs assessment for
retarded individuals.

_____, (with Stromer, R., and Striefel, S.)
Reduction of mouthing in an autistic child.

References:

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